

What Is Claimed Is:

1. A regulated flexible heater for using electrical power from a primary power supply to provide regulated heat, the regulated flexible heater comprising:

- 5 a temperature dependent variable resistance pathway including at least one flexible temperature dependent variable resistance strand of material having a positive coefficient of temperature to resistance;
- a set point resistor;
- 10 a comparator circuit element, wherein the comparator circuit element monitors the resistance of the flexible temperature dependent variable resistance pathway and the set point resistor, and wherein the comparator circuit element has a comparator output with a connect condition indicating when resistance of the
- 15 temperature dependent variable resistance pathway is below a control value having a predetermined relationship to the set point resistance and a disconnect condition indicating when the resistance of the temperature dependent variable resistance pathway is above the predetermined control value;
- 20 a heating circuit element including:
 - heating connections for receiving the electrical power from the primary power supply;
 - a conductive resistance pathway including at least one flexible conductive resistance strand of material;
- 25 a control circuit element receiving the comparator output, wherein the control circuit element opens the heating circuit element when the comparator output is in the disconnect condition;

- 5 wherein the flexible conductive resistance strand of material and
flexible temperature dependent variable resistance strand of
material are combined into a flexible planar body; and,
wherein the flexible temperature dependent variable resistance strand
of material and flexible conductive resistance strand of material
run separate and distinct routes through the flexible body.
2. The regulated flexible heater according to Claim 1, wherein the control
circuit element closes the heating circuit element when the comparator output
condition is in the connect condition.
- 10 3. The regulated flexible heater according to Claim 1, further including
secondary power connections for receiving a secondary power, wherein the
comparator circuit element further comprises:
a sensor resistor connected in series with the temperature dependent
variable resistance pathway and the secondary power
15 connections;
a set point divider resistor connected in series with the set point
resistor and the secondary power connections; and,
a voltage comparator receiving a sensor voltage from between the
sensor resistor and the temperature dependent variable
20 resistance pathway, receiving a set point voltage from between
the set point resistor and the set point divider resistor, wherein
the voltage comparator provides the comparator output based
upon the sensor voltage and the set point voltage.
4. The regulated flexible heater according to Claim 3, wherein the voltage
25 comparator comprises an op amp.
5. The regulated flexible heater according to Claim 1, wherein the control
circuit element includes a relay which opens the heating electrical circuit when
the comparator output is in the disconnect condition.

6. The regulated flexible heater according to Claim 5, wherein the control circuit element includes a transistor connected to receive the comparator output, and wherein the transistor amplifies the comparator output for activation and deactivation of the relay.

5 7. The regulated flexible heater according to Claim 1, wherein the temperature dependent variable resistance pathway comprises a plurality of flexible temperature dependent variable resistance strands of material having a positive coefficient of temperature to resistance.

10 8. The regulated flexible heater according to Claim 1, wherein the conductive resistance pathway comprises a plurality of flexible conductive resistance strands of material.

9. The regulated flexible heater according to Claim 1, wherein the flexible body further includes a plurality of flexible nonconductive strands of material interlaced together.

15 10. The regulated flexible heater according to Claim 9, wherein the flexible temperature dependent variable resistance strands of material, the flexible conductive strands of material, and the flexible nonconductive strands of material, are yarns.

20 11. A regulated flexible heater for using electrical power from a primary power supply to provide regulated heat, the regulated flexible heater comprising:

25 a temperature dependent variable resistance pathway including at least one flexible temperature dependent variable resistance strand of material having a negative coefficient of temperature to resistance;

a set point resistor;

a comparator circuit element, wherein the comparator circuit element monitors the resistance of the flexible temperature dependent variable resistance pathway and the set point resistor, and

5 wherein the comparator circuit element has a comparator output with a connect condition indicating when resistance of the temperature dependent variable resistance pathway is above a control value having a predetermined relationship to the set point resistance and a disconnect condition indicating when the resistance of the temperature dependent variable resistance pathway is below the predetermined control value;

a heating circuit element including:
10 heating connections for receiving the electrical power from the primary power supply;

a conductive resistance pathway including at least one flexible conductive resistance strand of material;

15 a control circuit element receiving the comparator output, wherein the control circuit element opens the heating circuit element when the comparator output is in the disconnect condition;

wherein the flexible conductive resistance strand of material and flexible temperature dependent variable resistance strand of material are combined into a flexible planar body; and,

20 wherein the flexible temperature dependent variable resistance strand of material and flexible conductive resistance strand of material run separate and distinct routes through the flexible body.

12. The regulated flexible heater according to Claim 11, wherein the control circuit element closes the heating circuit element when the comparator output condition is in the connect condition.
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13. The regulated flexible heater according to Claim 11, further including secondary power connections for receiving a secondary power, wherein the comparator circuit element further comprises:

- a sensor resistor connected in series with the temperature dependent variable resistance pathway and the secondary power connections;
- 5 a set point divider resistor connected in series with the set point resistor and the secondary power connections; and,
- a voltage comparator receiving a sensor voltage from between the sensor resistor and the temperature dependent variable resistance pathway, receiving a set point voltage from between the set point resistor and the set point divider resistor, wherein
- 10 the voltage comparator provides the comparator output based upon the sensor voltage and the set point voltage.
14. The regulated flexible heater according to Claim 13, wherein the voltage comparator comprises an op amp.
- 15 15. The regulated flexible heater according to Claim 11, wherein the control circuit element includes a relay which opens the heating electrical circuit when the comparator output is in the disconnect condition.
- 20 16. The regulated flexible heater according to Claim 15, wherein the control circuit element includes a transistor connected to receive the comparator output, and wherein the transistor amplifies the comparator output for activation and deactivation of the relay.
17. The regulated flexible heater according to Claim 11, wherein the temperature dependent variable resistance pathway comprises a plurality of flexible temperature dependent variable resistance strands of material having a negative coefficient of temperature to resistance.
- 25 18. The regulated flexible heater according to Claim 11, wherein the conductive resistance pathway comprises a plurality of flexible conductive resistance strands of material.

19. The regulated flexible heater according to Claim 11, wherein the flexible body further includes a plurality of flexible nonconductive strands of material interlaced together.

5 20. The regulated flexible heater according to Claim 19, wherein the flexible temperature dependent variable resistance strands of material, the flexible conductive strands of material, and the flexible nonconductive strands of material, are yarns.

21. A regulated flexible heater for using electrical power from a primary power supply to provide regulated heat, the regulated flexible heater
10 comprising:
a temperature dependent variable resistance pathway including at least one flexible temperature dependent variable resistance strand of material having a positive coefficient of temperature to resistance;
15 a variable set point resistor;
a comparator circuit element, wherein the comparator circuit element monitors the resistance of the flexible temperature dependent variable resistance pathway and the set point resistor, and wherein the comparator circuit element has a comparator output
20 with a connect condition indicating when resistance of the temperature dependent variable resistance pathway is below a control value having a predetermined relationship to the set point resistance and a disconnect condition indicating when the resistance of the temperature dependent variable resistance
25 pathway is above the predetermined control value;
a heating circuit element including:
heating connections for receiving the electrical power from the primary power supply;
a conductive resistance pathway including at least one flexible
30 conductive resistance strand of material;

- a control circuit element receiving the comparator output,
wherein the control circuit element opens the heating
circuit element when the comparator output is in the
disconnect condition; and,
- 5 wherein the flexible conductive resistance strand of material and
flexible temperature dependent variable resistance strand of
material are combined into a flexible planar body.
22. The regulated flexible heater according to Claim 21, wherein the
control circuit element closes the heating circuit element when the comparator
10 output condition is in the connect condition.
23. The regulated flexible heater according to Claim 21, further including
secondary power connections for receiving a secondary power, wherein the
comparator circuit element further comprises:
- 15 a sensor resistor connected in series with the temperature dependent
variable resistance pathway and the secondary power
connections;
- a set point divider resistor connected in series with the set point
resistor and the secondary power connections; and,
- 20 a voltage comparator receiving a sensor voltage from between the
sensor resistor and the temperature dependent variable
resistance pathway, receiving a set point voltage from between
the set point resistor and the set point divider resistor, wherein
the voltage comparator provides the comparator output based
upon the sensor voltage and the set point voltage.
- 25 24. The regulated flexible heater according to Claim 23, wherein the
voltage comparator comprises an op amp.
25. The regulated flexible heater according to Claim 21, wherein the
control circuit element includes a relay which opens the heating electrical
circuit when the comparator output is in the disconnect condition.

26. The regulated flexible heater according to Claim 25, wherein the control circuit element includes a transistor connected to receive the comparator output, and wherein the transistor amplifies the comparator output for activation and deactivation of the relay.

5 27. The regulated flexible heater according to Claim 21, wherein the temperature dependent variable resistance pathway comprises a plurality of flexible temperature dependent variable resistance strands of material having a positive coefficient of temperature to resistance.

10 28. The regulated flexible heater according to Claim 21, wherein the conductive resistance pathway comprises a plurality of flexible conductive resistance strands of material.

29. The regulated flexible heater according to Claim 21, wherein the flexible body further includes a plurality of flexible nonconductive strands of material interlaced together.

15 30. The regulated flexible heater according to Claim 29, wherein the flexible temperature dependent variable resistance strands of material, the flexible conductive strands of material, and the flexible nonconductive strands of material, are yarns.

20 31. A regulated flexible heater for using electrical power from a primary power supply to provide regulated heat, the regulated flexible heater comprising:

25 a temperature dependent variable resistance pathway including at least one flexible temperature dependent variable resistance strand of material having a negative coefficient of temperature to resistance;

a variable set point resistor;

a comparator circuit element, wherein the comparator circuit element monitors the resistance of the flexible temperature dependent variable resistance pathway and the set point resistor, and

- 5 wherein the comparator circuit element has a comparator output with a connect condition indicating when resistance of the temperature dependent variable resistance pathway is above a control value having a predetermined relationship to the set point resistance and a disconnect condition indicating when the resistance of the temperature dependent variable resistance pathway is below the predetermined control value;
- a heating circuit element including:
- 10 heating connections for receiving the electrical power from the primary power supply;
- a conductive resistance pathway including at least one flexible conductive resistance strand of material;
- a control circuit element receiving the comparator output, wherein the control circuit element opens the heating circuit element when the comparator output is in the disconnect condition; and,
- 15 wherein the flexible conductive resistance strand of material and flexible temperature dependent variable resistance strand of material are combined into a flexible planar body.
- 20 32. The regulated flexible heater according to Claim 31, wherein the control circuit element closes the heating circuit element when the comparator output condition is in the connect condition.
33. The regulated flexible heater according to Claim 31, further including secondary power connections for receiving a secondary power, wherein the comparator circuit element further comprises:
- 25 a sensor resistor connected in series with the temperature dependent variable resistance pathway and the secondary power connections;
- a set point divider resistor connected in series with the set point resistor and the secondary power connections; and,
- 30

5 a voltage comparator receiving a sensor voltage from between the
sensor resistor and the temperature dependent variable
resistance pathway, receiving a set point voltage from between
the set point resistor and the set point divider resistor, wherein
the voltage comparator provides the comparator output based
upon the sensor voltage and the set point voltage.

34. The regulated flexible heater according to Claim 33, wherein the
voltage comparator comprises an op amp.

10 35. The regulated flexible heater according to Claim 31, wherein the
control circuit element includes a relay which opens the heating electrical
circuit when the comparator output is in the disconnect condition.

15 36. The regulated flexible heater according to Claim 35, wherein the
control circuit element includes a transistor connected to receive the
comparator output, and wherein the transistor amplifies the comparator output
for activation and deactivation of the relay.

37. The regulated flexible heater according to Claim 31, wherein the
temperature dependent variable resistance pathway comprises a plurality of
flexible temperature dependent variable resistance strands of material having
a negative coefficient of temperature to resistance.

20 38. The regulated flexible heater according to Claim 31, wherein the
conductive resistance pathway comprises a plurality of flexible conductive
resistance strands of material.

25 39. The regulated flexible heater according to Claim 31, wherein the
flexible body further includes a plurality of flexible nonconductive strands of
material interlaced together.

40. The regulated flexible heater according to Claim 39, wherein the
flexible temperature dependent variable resistance strands of material, the

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flexible conductive strands of material, and the flexible nonconductive strands of material, are yarns.